J. Helminthol. Soc. Wash.
64(2), 1997 pp. 281–283

Research Note

Fessisentis necturorum (Acanthocephala: Fessisentidae) from the Red-Spotted Newt, *Notophthalmus v. viridescens*, in West Virginia

JAMES E. JOY[1,3] AND STUART W. THOMAS[2]

[1] Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755 and
[2] Department of Psychology, Marshall University, Huntington, West Virginia 25755

ABSTRACT: *Fessisentis necturorum* was found in 8 of 55 female and 25 of 69 male red-spotted newts, *Notophthalmus v. viridescens*, collected in Wayne County, West Virginia, throughout 1995. While mean intensities of 4.38 and 2.84 were recorded for female and male hosts, respectively, those means came from *F. necturorum* populations that had the same distribution in each host sex as calculated by the Kolmogorov-Smirnov 2-sample test. Sex ratios of *F. necturorum* were female-biased but did not depart significantly from a 1:1 ratio. Ninety-five of the 107 *F. necturorum* individuals collected were found in the upper third of the small intestine.

KEY WORDS: *Fessisentis*, *Notophthalmus*, red-spotted newt, West Virginia.

Adults of the red-spotted newt, *Notophthalmus v. viridescens* (Rafinesque), are found in a variety of shallow, permanent or semipermanent bodies of water from the Maritime Provinces to the Great Lakes and south to the Apalachicola drainage of Florida (Conant, 1958). This salamander is commonly found throughout the year and has been recorded from all but 4 of West Virginia's 55 counties (Green and Pauley, 1987). Helminth parasites of newts have been reported by several investigators, most notably Rankin (1937, 1945) from North Carolina and Massachusetts, Fischthal (1955) from New York, and Aho (1990) from Florida and South Carolina. Still, there has been little published about parasitic infections by sex of newt or on the location of parasites in these salamanders. The principal goal of this note is to report on seasonal prevalences and mean intensities of the acanthocephalan, *Fessisentis necturorum* Nickol, 1967, by sex of host. Location of *F. necturorum* in the intestinal tract and sex ratios of this acanthocephalan parasite are also given.

A total of 124 *Notophthalmus v. viridescens* was collected by hand or in funnel traps from a permanently flooded marsh at Shoals, West Virginia (38° 19′ 45″ N, 82° 28′ 18″ W) over 5 periods in 1995: late winter (Feb/Mar), late spring (May/Jun), midsummer (Aug), early fall (Oct), and late fall (Dec). Newt sample sizes by sex and period of collection are given in Table 1. Each newt was sexed and weighed to the nearest 0.1 g within 24 h of capture and then killed by pithing. After opening the body cavity, the intestinal tract was removed and segregated into the small intestine and large intestine. The small intestine was further subdivided into 3 equal regions as upper (nearest the stomach), middle, and lower small intestine. Acanthocephalans found were counted and their position in the intestine recorded. All acanthocephalans were killed and fixed in 10% buffered formalin acetate with representative specimens stained in acid carmine, dehydrated in an ethanol series, cleared in xylene, and mounted in Kleermount®. Voucher specimens of *Fessisentis necturorum* have been deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland, under USNPC Nos. 86238 (female) and 86239 (male). Terminology use is in accordance with that of Margolis et al. (1982).

Overall, 8 of 55 (14.5%) females and 25 of 69 (36.2%) males were infected by *F. necturorum*, with prevalences being highest in late winter and late fall and 0 in midsummer (Table 1). Prevalence by season was reminiscent of Rankin (1937), who noted that "[A]canthocephalans are found almost exclusively during winter months." Still, Nickol (1972) cited instances where seasonal distribution of *Fessisentis* infections varies with species of *Fessisentis* and host involved. Prevalence of *F. necturorum* infection in female newts was not significantly different from that in males ($\chi^2 = 1.16$, df

[3] Corresponding author.

Table 1. Seasonal prevalences and mean intensities of *Fessisentis necturorum* infections in female and male red-spotted newts from Shoals, West Virginia.

Season	Prevalence*		Mean intensity (±1 SD)†	
	♀♀	♂♂	♀♀	♂♂
Late winter	4/8 (50.0)	15/37 (40.5)	6.5	2.6
Late spring	1/8 (12.5)	1/8 (12.5)	3.0	2.0
Midsummer	0/21 (0)	0/0 (—)	—	—
Early fall	0/11 (0)	2/11 (18.2)	—	2.5
Late fall	3/7 (42.9)	7/13 (53.8)	2.0	3.6
Combined	8/55 (14.5)	25/69 (36.2)	4.38 (3.93)§	2.84 (2.48)§
	8/34 (23.5)‡	25/69 (36.2)‡		

* Number infected/number examined (percent).

† Standard deviations not given by season because of small sample sizes of infected newts.

‡ χ^2 (Yates's) = 1.16, df = 1, $P > 0.05$.

§ $n_1n_2D = 45 < n_1n_2D_{05} = 104$; accept H_0 that population distributions of *F. necturorum* are the same in female and male hosts.

= 1, $P > 0.05$). Newts collected in midsummer were excluded from this prevalence comparison because of the absence of *F. necturorum* infection and because of the obvious similarity in prevalences between host sexes for the other 4 collection periods (Table 1). Seasonal mean intensities appear relatively consistent throughout the year, irrespective of the considerable fluctuation in seasonal prevalences, with overall mean intensity in female hosts higher than in males (Table 1). Because variances for mean intensities were high and appeared positively related to the magnitude of the mean, we used a nonparametric test (Kolmogorov-Smirnov 2-sample test) to determine whether populations of *F. necturorum* in female hosts had the same distribution as in male hosts (Sokal and Rohlf, 1995). Because the calculated Kolmogorov-Smirnov sample statistic n_1n_2D of 45 was less than the tabled critical value of 104 for n_1n_2D at the $P < 0.05$ level, we accepted the null hypothesis that *F. necturorum* populations had the same distribution in both sexes of newts (Table 1).

Sex ratios of this acanthocephalan parasite varied by season and were female-biased for the entire study period. The ratio of 63 *F. necturorum* females to 43 males was not, however, significantly different from a 1:1 ratio (Table 2). Similarly, Nickol and Heard (1973) reported a sex ratio of nearly 1:1 for *F. necturorum* in *Ambystoma opacum*. Only 3 of the 63 *F. necturorum* females were found with well-developed eggs, and all 3 of those individuals were collected on 16 June.

Ninety-five of the 107 (88.8%) *F. necturorum* collected in this study were found in the upper small intestine. Aggregation of acanthocephalans in this region of the intestine was highly significant (Table 3) but not without precedent, as Huffman (1970) noted that all *F. shoemakeri*

Table 2. Sex of *Fessisentis necturorum* individuals collected from red-spotted newts, by season. Chi-square value significant ($P < 0.005$) only for parasite sex ratio observed in the late winter collection.

Season	No. of *F. necturorum*			Sex ratio (♀♀:♂♂)	χ^2
	♀♀	♂♂	Juvenile		
Late winter	44	20	1	2.20 : 1.00	9.00
Late spring	4	1	0	4.00 : 1.00	NC*
Midsummer	0	0	0	—	—
Early fall	2	3	0	0.67 : 1.00	NC
Late fall	13	19	0	1.00 : 1.46	1.13
Combined	63	43	1	1.47 : 1.00	3.77

* Not calculated because of small sample numbers.

Table 3. Numbers of *Fessisentis necturorum* in hosts by season and position in gastrointestinal tract.*

Season	u	m	l	g	Totals
Late winter	58	4	3	0	65
Late spring	5	0	0	0	5
Midsummer	0	0	0	0	0
Early fall	5	0	0	0	5
Late fall	27	2	1	2	32
Combined†	95	6	4	2	107

* Abbreviations: u = upper small intestine, m = middle small intestine, l = lower small intestine, g = large intestine.

† $\chi^2 = 232.48$, df = 3, $P < 0.001$.

(=*F. necturorum*) individuals were found in the duodenum of *A. opacum*.

In summary, this work adds to the information on prevalence of *F. necturorum* in newts and is reminiscent of the study by Rankin (1937) demonstrating seasonal fluctuations in acanthocephalan populations. Our study also corroborates earlier findings on sex ratios of *F. necturorum* (Nickol and Heard, 1973), and the position of this parasite species in the host's intestine (Huffman, 1970). Information on mean intensities by host sex is new. West Virginia represents the northernmost extent of the range for *F. necturorum*, because this acanthocephalan species was not found in studies involving large sample sizes of newts from Massachusetts (Rankin, 1945) and New York (Fischthal, 1955). Additional work on *F. necturorum* populations from newts in other geographic regions should be encouraged.

We thank Brent Nickol for diagnosing our acanthocephalan material as *Fessisentis necturorum*. Collection of newts for this study was done under permit No. 85-1995, granted by the West Virginia Division of Natural Resources.

Literature Cited

Aho, J. M. 1990. Helminth communities of amphibians and reptiles: comparative approaches to understanding patterns and processes. Pages 157–195 *in* G. W. Esch, A. O. Bush, and J. M. Aho, eds. Parasite Communities: Patterns and Processes. Chapman and Hall, New York.

Conant, R. 1958. A Field Guide to Reptiles and Amphibians. Houghton Mifflin, Boston. 366 pp.

Fischthal, J. H. 1955. Ecology of worm parasites in south-central New York salamanders. American Midland Naturalist 53:176–183.

Green, N. B., and T. K. Pauley. 1987. Amphibians and Reptiles in West Virginia. University of Pittsburgh Press, Pittsburgh. 241 pp.

Huffman, D. G. 1970. *Fessisentis shoemakeri* sp. n. (Acanthocephala: Fessisentidae) from the larvae of *Ambystoma opacum* (Caudata), with notes on the life cycle. Unpublished M.S. Thesis, Marshall University, Huntington, West Virginia. 47 pp.

Margolis, L. G., G. W. Esch, J. C. Holmes, A. M. Kuris, and G. A. Schad. 1982. The use of ecological terms in parasitology (report of an ad hoc committee of the American Society of Parasitologists). Journal of Parasitology 68:131–133.

Nickol, B. B. 1972. *Fessisentis*, a genus of acanthocephalans parasitic in North American poikilotherms. Journal of Parasitology 58:282–289.

———, **and R. W. Heard III.** 1973. Host–parasite relationships of *Fessisentis necturorum* (Acanthocephala: Fessisentidae). Proceedings of the Helminthological Society of Washington 40:204–208.

Rankin, J. S., Jr. 1937. An ecological study of parasites of some North Carolina salamanders. Ecological Monographs 7:169–270.

———. 1945. An ecological study of the helminth parasites of amphibians and reptiles of western Massachusetts and vicinity. Journal of Parasitology 31:142–150.

Sokal R. R., and F. J. Rohlf. 1995. Biometry: The Principles and Practice of Statistics in Biological Research, 3rd ed. W. H. Freeman, New York. 887 pp.

J. Helminthol. Soc. Wash.
64(2), 1997 pp. 283–285

Research Note

Field Test of Activity of the Low Dose Rate (2.64 mg/kg) of Pyrantel Tartrate on *Anoplocephala perfoliata* in Thoroughbreds on a Farm in Central Kentucky

EUGENE T. LYONS,[1] SHARON C. TOLLIVER, KAREN J. MCDOWELL, AND J. HAROLD DRUDGE

Department of Veterinary Science, Gluck Equine Research Center, University of Kentucky, Lexington, Kentucky 40546-0099

ABSTRACT: A field test was done to evaluate activity on *Anoplocephala perfoliata* for the low dose rate (2.64 mg/kg) of pyrantel tartrate fed once daily for 30 consecutive days to Thoroughbred mares (n = 83) and yearlings (n = 58) on a farm in central Kentucky. Tapeworm eggs were found pretreatment in feces of 35% of the mares and 33% of the yearlings. Posttreat-

[1]Corresponding author (e-mail:elyons1@pop.uky.edu).